Historical ore processing in Idrija: Case study of a unique mercury waste disposal site

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The production of mercury in Idrija started in 1492. In the first decade of mercury mining in Idrija the ore was roasted in piles**.** After that the ore was roasted for 150 years, until 1652, in earthen vessels at various sites in the woods around Idrija. Up to now 21 localities of ancient roasting sites have been established on the neighbouring hills and in more distant localities [1].

Roasting of ore in piles and in earthen vessels gave a very poor yield and resulted in considerable losses. Because of the high temperatures usually a third of earthen vessels cracked during burning and mercury escaped from the vessels. Large quantities of broken pottery (up to 2 m) can be found at the localities of old roasting sites. The concentrations of Hg at those places are, of course, very high (up to 7,474 mg/kg). The determined mercury contents in soils at old roasting sites are very high, and they surpass all hitherto described localities at Idrija and in its surroundings [2-4].

Pšenk is one of the larger localities of roasting vessels fragments. The investigated soil profile Pšenk contains at top a 45 cm thick humic layer with 4,000 to 5,000 mg/kg Hg. Deeper mercury contents decrease to around 100 mg/kg Hg. The calculations result in an estimated amount of 1.4 t Hg still present at the Pšenk locality. The Hg-thermo-desorption curves [5] indicate the presence of mercury in the form of cinnabar and that of mercury bound to organic matter. The amount of the non-cinnabar fraction is important since it is potentially bioavailable and results are needed for further risk assessment studies. A detailed geochemical survey is being carried out to evaluate the extent of the pollution at old roasting sites and to determine the changes in mercury speciation and transport through centuries.

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Evolution of the Southern Ethiopian Rift System: Constrained from geochronological and geochemical data of mafic lavas of Amaro and Yabello areas

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We present new K-Ar age and comprehensive geochemical dataset for mafic lavas of Amaro and Yabello areas from southern Ethiopia, where the earliest manifestation of basaltic volcanism in the East African Rift System (EARS) is recognized. Based on the K-Ar data, basaltic lavas in southern Ethiopia can be classified into five stages: Stage-1 tholeiitic and transitional basalts at 28-39 Ma, Stage-2 basalts to basaltic trachyandesites at 11-17 Ma, Stage-3 basanites at 7-8 Ma, Stage-4 tholeiitic basalts at 3-4 Ma, and Stage-5 basanites and alkaline basalts at <1 Ma. The thickness of Stage-1 tholeiitic and transitional basalts increases towards the NW-SE trending Mesozoic graben system of northwest Kenya to the south-west Ethiopia, suggesting they were formed by extension in this graben system. Most of these tholeiitic and transitional lavas show distinctively low εHf and εNd and high $^{87}Sr/^{86}Sr$ values and low Ce/Pb and high Ba/Nb ratios which possibly can show the affect of crustal contamination associated with thick crust prior to the initiation of the EARS. The cessation of the NW-SE rift activity was followed by northward and southward rift propagations, forming Stage-2 and -3 lavas respectively. The Stage-2 alkaline lavas have characteristically radiogenic Pb isotopic signature than the Stage-3 basanites. The continuation of the southward rift propagation resulted in the formation of Stage-4 tholeiitic basalts which have less radiogenic Pb and high εHf and $^{87}Sr/^{86}Sr$ compositions similar to the least contaminated Stage-1 tholeiitic basalts. It was followed by Stage-5 alkaline basalts and basanites in the northern and southern part, respectively along active border faults. Consequently, the southern Ethiopian volcanic province can be interpreted as the intersection of three rift systems. The petrological and geochemical characteristics of mafic lavas in these rift systems had been controlled by variable degree of partial melting of heterogeneous asthenospheric mantle associated with fluctuation of extension in each rift system.